

***APPLICATIONS OF THE ASSOCIATED-PARTICLE NEUTRON-TIME-OF-
FLIGHT INTERROGATION TECHNIQUE – FROM SHEEP TO
UNEXPLODED ORDNANCE***

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ABSTRACT

The associated-particle technique (APT) will be presented for some diverse applications that include on the one hand, analyzing the body composition of live sheep and on the other, identifying the fillers of unexploded ordnance (UXO). What began with proof-of-concept studies using a large laboratory based 14 MeV neutron generator of the “associated-particle” type, soon became possible for the first time to measure total body protein, fat and water simultaneously in live sheep using a compact field deployable associated-particle sealed-tube neutron generator (APSTNG). This non-invasive technique offered the animal physiologist a tool to monitor the growth of an animal in response to new genetic, nutritional and pharmacologic methods for livestock improvement. While measurement of carbon (C), nitrogen (N) and oxygen (O) determined protein, fat and water because of the fixed stoichiometric proportions of these elements in these body components, the unique C/N and C/O ratios of high explosives revealed their identity in UXO. The algorithm that was developed and implemented to extract C, N and O counts from an APT generated gamma-ray spectrum will be presented together with the UXO investigations that involved preliminary proof-of-concept studies and modeling with Monte Carlo produced synthetic spectra of 57-155 mm projectiles.